

## **REMARKS**

### ***Summary of the Amendment***

Upon entry of the present Amendment, Claims 15, 27 and 30 will have been amended and new Claim 32 will have been added. Accordingly, Claims 1-21 and 27-32 remain currently pending. By the present Amendment and Remarks, Applicant submits that the rejections have been overcome, and respectfully requests reconsideration of the outstanding Final Office Action.

### ***Summary of the Office Action***

In the subject Final Office Action, Claims 1-6 and 11-21 are rejected as being anticipated over the art of record; and Claims 7-10 and 27-31 are rejected as being obvious over the art of record. For the reasons set forth below, Applicant submits that each of the pending claims is allowable over the cited art, and an indication of allowability of the present application is therefore respectfully requested. Further, Applicant notes and compliments the Examiner on her thoroughness (e.g., providing supplemental figures explaining the rejections) in generating the subject Office Action.

### ***Telephone Interview with Examiner Chu***

Applicant gratefully acknowledges the courtesy extended to their representative by Examiner Chu in conducting a telephone interview on June 30<sup>th</sup>, 2004. In the interview, the distinguishing features of the present invention were discussed.

In particular, Applicant's representative pointed out to the Examiner the language in independent Claim 1 which recites, *inter alia*, . . . *a generally planar third surface disposed in opposed, substantially parallel relation to the second surface and laterally offset outwardly relative to the first surface* . . . Furthermore, Applicant's representative submitted that the art of record does not teach or suggest the aforementioned features of the present invention.

The Examiner agreed to give further consideration to the Applicant's arguments when presented in an After Final Response.

***Traversal of Rejection Under 35 U.S.C. § 102(e)***

Applicant respectfully traverses the rejection of Claims 1-6 and 11-21 under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,337,510 B1 to Chun-Jen et al. [hereinafter "CHUN-JEN"].

On page 2 of the subject Final Office Action, the Examiner has again labeled various parts of the semiconductor package 300 shown in Figure 5 of CHUN-JEN with reference letters A-E to clarify the rejection. The letter "A" is correlated to the first surface recited in Claim 1, the letter "B" to the second surface, and the letter "C" to the third surface. The letter "D" is correlated to the outer end of each lead described in Claim 15, with the letter "E" being correlated to the fourth surface of each lead described in Claim 16. It is noted that the Examiner has redrawn the corresponding arrowhead lines for the reference letters "A" and "B" in different positions as compared to the previous Office Action. In particular, the Examiner states that "A" is "the generally planar surface area where the solder ball 330 is not attached" and that "B" is "the generally planar surface area where the solder ball 330 is not attached".

Applicant respectfully disagrees with the Examiner's position.

***A Review of CHUN-JEN***

Figure 5 of CHUN-JEN teaches a stackable QFN semiconductor package 300. In this embodiment, a second die 350 is stacked above the first die 310. The second die 350 is the same size of the first die 310. The first die 310 has bonding pads arranged on the top surface thereof, and near the perimeter edge of the first die 310. The second die 350 has bonding pads arranged on the bottom surface thereof, and near the perimeter edge of the second die 350. A plurality of leads 320 are provided outwards from the first and second dies 310, 350 and partially form the exterior side of the package 300. The leads 320 each have a finger 322 which protrudes inwardly from an inner top portion thereof. Each finger 322 extends downward at about a forty-five degree angle, and further includes a distal tip which is positioned between the outer edges first and second dies 310, 350. Solder bumps 330 connect the fingers 322 to the bonding pads arranged on the top surface of the first die 310 and the bonding pads arranged on the bottom surface of the second die 350. Further, the first

and second dies 310, 350, plurality of leads 320, and solder bumps 330 are encapsulated with molding compound 340 to form the semiconductor package 300.

*In re Independent Claim 1 (and Dependent Claims 2-6 and 11-21)*

Applicant's independent Claim 1, recites, *inter alia*, . . . *a generally planar third surface disposed in opposed, substantially parallel relation to the second surface and laterally offset outwardly relative to the first surface . . .*

On the other hand, CHUN-JEN does not teach the aforementioned feature. Instead, the CHUN-JEN third surface "C" (as labeled by the Examiner) is laterally offset, *but not opposed* to the CHUN-JEN second surface "B" (as labeled by the Examiner). In more particularity, although the CHUN-JEN first surface "A" (as labeled by the Examiner) is opposed to CHUN-JEN second surface "B", neither the CHUN-JEN first surface "A" or second surface "B" is in *opposed* relation to the CHUN-JEN third surface "C". As a result, CHUN-JEN does not teach *a generally planar third surface disposed in opposed, substantially parallel relation to the second surface and laterally offset outwardly relative to the first surface*, as is recited in Applicant's independent Claim 1.

It is also noted that the present invention has several notable advantages over CHUN-JEN. First, it is noted that the present invention provides a more compact package than CHUN-JEN. In particular, the downwardly angled fingers 322 taught by CHUN-JEN must clear the perimeter edges of the first and second dies 310, 350. Thus, this feature dictates that the CHUN-JEN leads must be appropriately spaced outwardly from the dies 310, 350 such that interference between the fingers 322 and the perimeter edges of the dies 310, 350 does not occur. In contrast, the configuration of the present invention's leads 130 allows the leads 130 to be positioned more closely to the perimeter edges of the dies 110, 120 without the threat of any interference at all from the fingers of the leads 130.

Another advantage of the present invention is that the shape of the leads 130 is far less complex than the peculiar shape of the CHUN-JEN leads 320, and therefore, the leads 130 present invention can be manufactured more economically than the leads 320 taught by CHUN-JEN. Thus, overall, it is noted that the present invention provides a more compact package, while at the same time being less expensive to manufacture as compared to the CHUN-JEN package.

For the foregoing reasons, and because CHUN-JEN fails to disclose the above-noted features of the present invention, Applicant submits that CHUN-JEN fails to disclose each and every feature of the present invention, as recited in independent Claim 1.

Accordingly, Applicant submits that the Examiner has failed to provide an adequate evidentiary basis to support a rejection under U.S.C. § 102(e) and that the rejection of Claim 1 is improper and should be withdrawn.

Applicant further submits that dependent Claims 2-6 and 11-21 are allowable at least for the reason that these claims depend from allowable independent Claim 1 and because these claims recite additional features that further define the present invention.

Accordingly, Applicant requests that the Examiner reconsider and withdraw the rejection of Claims 2-6 and 11-21 under 35 U.S.C. § 102(e) and indicate that these claims are also allowable.

***Traversal of Rejection Under 35 U.S.C. § 103(a)***

**CHUN-JEN in view of TAKAHASHI**

Applicant respectfully traverses the rejection of Claims 7-9 and 27-31 under 35 U.S.C. § 103(a) over CHUN-JEN in view of Japanese Patent JP-05206219 to Takahashi [hereinafter "TAKAHASHI"].

In regard to Claims 7-9, the Examiner contends that CHUN-JEN discloses the claimed invention, except for each of the leads including first and second protective layers on the bump land. The Examiner then submits that it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify CHUN-JEN by using first and second protective layers as taught by TAKAHASHI. The Examiner further submits that one of ordinary skill in the art would have been motivated to modify CHUN-JEN in the manner described above for at least the purpose of preventing a short circuit.

Applicant respectfully disagrees with the Examiner's position.

**A Review of TAKAHASHI**

The purpose of the teachings of TAKAHASHI is to prevent the short circuit of semiconductor element 16 due to unwanted contact with inner leads 10 by covering the

plated surfaces of the inner leads 10 of a semiconductor package with an insulative coating film 13. As shown in Figures 1-5, the surface of a plated layer 12 of an inner lead 10 of the film carrier system package is covered by an insulative coating film 13. When the inner lead 10 is bonded to a semiconductor element 16, the insulative coating film 13 is melted only at the bonding part of the inner lead 10. The inner lead 10 is bonded to a protruding type electrode 17 of a semiconductor element 16. Hence, short circuits are prevented, even when the gap between the inner lead 10 and the semiconductor element 16 is made very narrow, or even when the inner lead 10 comes into contact with the semiconductor element 16. Further, when the inner lead 10 is bent and brought into contact with the adjacent inner lead 10, a short circuit can be prevented by forming the insulative coating film 13.

*In re Dependent Claims 7 and 9*

As discussed *supra*, Applicant's independent Claim 1, recites, *inter alia*, . . . *a generally planar third surface disposed in opposed, substantially parallel relation to the second surface and laterally offset outwardly relative to the first surface . . .*

On the other hand, as discussed *supra*, CHUN-JEN does not teach the aforementioned feature. Thus, Applicant submits that since CHUN-JEN does not teach or suggest *a generally planar third surface disposed in opposed, substantially parallel relation to the second surface and laterally offset outwardly relative to the first surface*, no proper combination of CHUN-JEN or TAKAHASHI can render unpatentable the combination of the features recited in independent Claim 1.

Further, for the foregoing reasons, Applicant submits that dependent Claims 7 and 9 are allowable at least for the reason that they depend from allowable independent Claim 1 and because dependent Claims 7 and 9 recite additional features that further define the present invention.

Accordingly, Applicant requests that the Examiner reconsider and withdraw the rejection of dependent Claims 7 and 9 under 35 U.S.C. § 103(a) and indicate that these claims are allowable.

In re Independent Claims 27 and 30 (and Dependent Claims 28-29)

Applicant's independent Claims 27 and 30 as amended recite, *inter alia*, . . . a plurality of protective layers formed on prescribed regions of respective ones of the leads, *each of the protective layers, **at the time of formation**, being configured such that a portion of a corresponding one of the leads is exposed therein so as to define a land* . . .

On the other hand, TAKAHASHI does not teach a protective layer applied to the lead *such that a portion of the lead is exposed so as to define a land*. Though TAKAHASHI teaches applying an insulative coating film 13 to each of the leads 10, a portion of each lead 10 is never exposed to form a land. Rather, when the protruding type electrode 17 is bonded to the lead 10, only then does the insulative coating film 13 melt. **Therefore, TAKAHASHI does not teach configuring the film 13 to define a land at the time the film 13 is formed.**

It is also noted that the present invention has another advantage over the TAKAHASHI teaching. A downfall of the TAKAHASHI teaching is that the insulative coating film 13 must first be melted before bonding can occur. If the insulative coating film 13 does not sufficiently melt, and thus is not successfully displaced by the protruding electrode 17, a good electrical connection is not assured. On the other hand, as compared to TAKAHASHI, with the present invention, the manner in which the bumps 150 are connected to the first and second lower surfaces 131, 132 of the leads 130 is more reliable. Thus, Applicant submits that the present invention provides a more reliable manner to electrically connect the leads to the dies than does TAKAHASHI.

For the foregoing reasons, and because neither CHUN-JEN or TAKAHASHI disclose or suggest, *inter alia*, . . . a plurality of protective layers formed on prescribed regions of respective ones of the leads, *each of the protective layers, **at the time of formation**, being configured such that a portion of a corresponding one of the leads is exposed therein so as to define a land* . . . , Applicant submits that no proper combination of these references can render unpatentable the combination of features recited in at least independent Claims 27 and 30 as now amended.

Accordingly, Applicant requests that the Examiner reconsider and withdraw the rejection of independent Claims 27 and 30 under 35 U.S.C. § 103(a) and indicate that these claims are allowable.

Further, for the foregoing reasons, Applicant submits that dependent Claims 28 and 29 are allowable at least for the reason that they depend from allowable independent Claim 27 and because dependent Claims 28 and 29 recite additional features that further define the present invention.

Accordingly, Applicant requests that the Examiner reconsider and withdraw the rejection of dependent Claims 28 and 29 under 35 U.S.C. § 103(a) and indicate that these claims are allowable.

CHUN-JEN in view of TAKAHASHI and in further view of LEE

Applicant respectfully traverses the rejection of Claims 8 and 10 over CHUN-JEN and TAKAHASHI as applied to Claims 7 and 9 above, and further in view of U.S. Patent No. 6,157,074 to Lee [hereinafter "LEE"].

With regard to Claims 8 and 10, the Examiner submits that while TAKAHASHI teaches the use of the lead finger protective layers, TAKAHASHI does not appear to provide any example of the protective layer's specific composition. The Examiner then states that LEE teaches (Fig. 12, col. 7, lines 58-60) protective layers composed of a polyimide. The Examiner then further states that it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply polyimide as the specific material to form the protective layers on the lead fingers of CHUN-JEN and TAKAHASHI as taught by LEE to prevent electrical coupling between the chip and lead fingers.

A Review of LEE

LEE discloses a semiconductor package having a leadframe which can be used to perform a package process regardless of the size of the chip 3. As shown in Figure 12, coining is performed in the downset portion of the inner lead 6 to flatten the upper surface of the inner lead 6, and at the same time to form a coined surface 9 having a step. As a result, bonding between one end of connecting members 10 such as gold wires can be enhanced during wire bonding. An insulating layer 11 is attached to the top surface of the inner lead 6 which has the same height as the epoxy 12 doped on the die pad 4. Further, the coined surface 9 of the inner lead 6 is plated with a metal thin film having excellent electric conductivity, preferably Ag. Thus, Ag-plating is performed in the down-set portion of the

inner lead 6 while Ag-plating is not performed on tie bar 2. Further, the insulating member 11 preferably includes a bond layer 11a of polyimide attached on the inner lead 6, and an insulating film 11b attached on the bond 11a. Applicant notes, however, that Figure 12 does not explicitly illustrate the details of the bond layer 11a of polyimide attached to the inner lead 6, or the insulating film 11b attached on the bond 11a, and therefore, such feature may not even be properly enabled.

*In re Dependent Claims 8 and 10*

As discussed *supra*, Applicant's independent Claim 1 recites, *inter alia*, . . . *a generally planar third surface disposed in **opposed**, substantially parallel relation to the second surface and laterally offset outwardly relative to the first surface* . . .

On the other hand, as discussed previously, CHUN-JEN does not teach the aforementioned feature. Thus, Applicant submits that since CHUN-JEN does not teach or suggest *a generally planar third surface disposed in **opposed**, substantially parallel relation to the second surface and laterally offset outwardly relative to the first surface*, no proper combination of CHUN-JEN, TAKAHASHI or LEE can render unpatentable the combination of the features now recited in independent Claim 1.

Further, for the foregoing reasons, Applicant submits that dependent Claims 8 and 10 are allowable at least for the reason that they depend from allowable independent Claim 1 and because dependent Claims 8 and 10 recite additional features that further define the present invention.

Accordingly, Applicant requests that the Examiner reconsider and withdraw the rejection of dependent Claims 8 and 10 under 35 U.S.C. § 103(a) and indicate that these claims are allowable.

***New Dependent Claim 32 is Allowable***

Applicant submits that newly submitted dependent Claim 32 is allowable at least for the reason that it depends from allowable independent Claim 1 and because dependent Claim 32 recites additional features that further define the present invention.

In particular, new dependent Claim 32 recites, *inter alia*, the semiconductor package further in combination with a second semiconductor package identically configured to the



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semiconductor package, at least some of the leads of the second semiconductor package being electrically connected to at least some of the leads of the semiconductor package.

Accordingly, Applicant requests that the Examiner indicate that new dependent Claim 32 is allowable

***Application is Allowable***

Applicant respectfully submits that each and every pending claim of the present application meets the requirements for patentability, and respectfully requests the Examiner to indicate the allowance of such claims.

**CONCLUSION**

Applicant respectfully submits that each and every pending claim of the present application meets the requirements for patentability under 35 U.S.C. §§ 102 and 103, and respectfully requests that the Examiner indicate the allowance of such claims.

In view of the foregoing, it is submitted that none of the references of record anticipate or render obvious the Applicant's invention as recited in Claims 1-21 and 27-32. The applied references of record have been discussed and distinguished, while claimed features of the present invention have been pointed out.

Further, any amendments to the claims which have been made in this response and which have not been specifically noted to overcome a rejection based upon prior art, should be considered to have been made for a purpose unrelated to patentability, and no estoppel should be deemed to attach thereto.

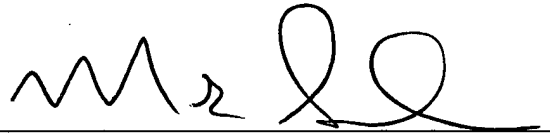
Accordingly, reconsideration of the outstanding Office Action and allowance of the present application and all the claims therein is respectfully requested and now believed to be appropriate.

If any additional fee is required, please charge Deposit Account Number 19-4330.

Respectfully submitted,

Date: 8/3/01

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